

We had to add business intelligence in this lab.
We did this using ASP.NET Web Forms, ASP.NET Core web api.

We implemented the following functionalities.

Product recommendation system:

A recommendation feature was implemented during product selection. When a customer clicks the recommendation button, the system displays products frequently purchased together with the selected item.

The frontend calls the following API:

<http://maha.somee.com/publish/api/recommendations/>

The API analyzes order history and identifies products purchased in the same order.

Reordering Suggestions:

A reorder suggestion feature was added in the cart page. Customers can view products they previously purchased and reorder them easily.

The frontend calls:

<http://maha.somee.com/publish/api/reorder/>

The API retrieves products from the customer's previous orders.

Forecasting for Employees

A forecasting feature was implemented for employees. The system predicts secondary items whose demand may increase when a primary product's sales increase.

The frontend calls:

<http://maha.somee.com/publish/api/forecast/>

The API calculates frequency of products commonly purchased together.

API Implementation:

ASP.NET Core Minimal APIs were used to implement recommendation services. APIs return JSON responses which are consumed by ASP.NET Web Forms using WebClient and Newtonsoft.Json.

```
app.MapGet("/api/recommendations/{productId}", (int productId,
IConfiguration config) =>
{
    List<string> results = new List<string>();
    string connStr = config.GetConnectionString("PVFC");
    using (SqlConnection con = new SqlConnection(connStr))
    {
        con.Open();
        string query = @"
            SELECT DISTINCT p2.Product_Description
            FROM Order_line_t ol1
            JOIN Order_line_t ol2 ON ol1.Order_Id = ol2.Order_Id
            JOIN PRODUCT_t p1 ON ol1.Product_Id = p1.Product_Id
            JOIN PRODUCT_t p2 ON ol2.Product_Id = p2.Product_Id
            WHERE ol1.Product_Id = @pid AND ol2.Product_Id <> @pid";
        SqlCommand cmd = new SqlCommand(query, con);
        cmd.Parameters.AddWithValue("@pid", productId);
        SqlDataReader reader = cmd.ExecuteReader();
        while (reader.Read()) {
            results.Add(reader["Product_Description"].ToString());
        }
        return results;
    });
});

app.MapGet("/api/reorder/{customerId}", (int customerId, IConfiguration
config) =>
{
    List<string> result = new List<string>();
    string connStr = config.GetConnectionString("PVFC");
    using (SqlConnection con = new SqlConnection(connStr))
    {
        con.Open();
        string query = @"
            SELECT DISTINCT P.Product_Description
            FROM ORDER_t O
            JOIN Order_line_t OL ON O.Order_Id = OL.Order_Id
```

```

        JOIN PRODUCT_t P ON P.Product_Id = OL.Product_Id
        WHERE O.Customer_Id = @cid";
    SqlCommand cmd = new SqlCommand(query, con);
    cmd.Parameters.AddWithValue("@cid", customerId);
    SqlDataReader dr = cmd.ExecuteReader();
    while (dr.Read()) {
result.Add(dr["Product_Description"].ToString()); }
    }
    return result;
});

app.MapGet("/api/forecast/{productId}", (int productId, IConfiguration
config) =>
{
    List<object> result = new List<object>();
    string connStr = config.GetConnectionString("PVFC");
    using (SqlConnection con = new SqlConnection(connStr))
    {
        con.Open();
        string query = @"
            SELECT TOP 5 p2.Product_Description, COUNT(*) AS Frequency
            FROM Order_line_t ol1
            JOIN Order_line_t ol2 ON ol1.Order_Id = ol2.Order_Id
            JOIN PRODUCT_t p1 ON ol1.Product_Id = p1.Product_Id
            JOIN PRODUCT_t p2 ON ol2.Product_Id = p2.Product_Id
            WHERE ol1.Product_Id = @pid AND ol2.Product_Id <> @pid
            GROUP BY p2.Product_Description
            ORDER BY Frequency DESC";

        SqlCommand cmd = new SqlCommand(query, con);
        cmd.Parameters.AddWithValue("@pid", productId);
        SqlDataReader dr = cmd.ExecuteReader();
        while (dr.Read())
        {
            result.Add(new {
                Product = dr["Product_Description"].ToString(),
                DemandScore = dr["Frequency"].ToString()
            });
        }
    }
    return result;
}

```

```
});
```

All the pages except cart, search and employee dashboard were same as lab 07.

Employee Dashboard

.aspx

```
<%@ Page Language="VB" AutoEventWireup="true" CodeFile="employee_dashboard.aspx.vb"  
Inherits="employee_dashboard" %>
```

```
<!DOCTYPE html>
```

```
<html>
```

```
<head runat="server">
```

```
  <title>Employee Dashboard</title>
```

```
  <link rel="stylesheet" href="style.css" />
```

```
</head>
```

```
<body>
```

```
<form id="form1" runat="server">
```

```
  <header>
```

```
    <h1>Employee Dashboard</h1>
```

```
  </header>
```

```
  <nav>
```

```
    <ul>
```

```
      <li>
```

```
        <asp:HyperLink ID="hlUpdateCatalog" runat="server"
```

```
          NavigateUrl="update_catalog.aspx"
```

```
          Text="Update Product Catalog" />
```

```
      </li>
```

```
      <li>
```

```
        <asp:HyperLink ID="hlUpdateCustomer" runat="server"
```

```
          NavigateUrl="update_customer.aspx"
```

```
          Text="Update Customer" />
```

```
      </li>
```

```
      <li>
```

```
        <asp:HyperLink ID="hlSegmentation" runat="server"
```

```
          NavigateUrl="Segmentation.aspx"
```

```
          Text="Customer Segmentation" />
```

```
      </li>
```

```
      <li>
```

```
        <asp:Button ID="btnLogout" runat="server"
```

```
          Text="Logout"
```

```
          CssClass="btn"
```

```

        OnClick="btnLogout_Click" />
    </li>

</ul>
</nav>

<div class="container">

    <h2>Welcome, Employee!</h2>

    <p>Select an option from the menu above to proceed.</p>

    <hr />

    <h3>Inventory Forecasting (Secondary Items Demand)</h3>

    <asp:Label Text="Enter Primary Product ID:" runat="server" />

    <asp:TextBox ID="txtProductId" runat="server"></asp:TextBox>

    <asp:Button ID="btnForecast"
        runat="server"
        Text="Forecast Demand"
        CssClass="btn"
        OnClick="btnForecast_Click" />

    <br /><br />

    <asp:GridView ID="gvForecast"
        runat="server"
        CssClass="cart-table">
    </asp:GridView>

</div>

</form>

</body>
</html>

```

.vb:

```

Imports Newtonsoft.Json
Imports System.Net
Imports System.Data

```

```

Partial Class employee_dashboard
    Inherits System.Web.UI.Page

```

```

    Protected Sub Page_Load(sender As Object, e As EventArgs) Handles Me.Load
        If Session("Role") Is Nothing OrElse Session("Role").ToString() <> "Employee" Then
            Response.Redirect("EmployeeLogin.aspx")
        End If
    End Sub

```

```
End If  
End Sub
```

```
Protected Sub btnLogout_Click(sender As Object, e As EventArgs)  
    Session.Clear()  
    Response.Redirect("LoginChoice.aspx")  
End Sub
```

```
Protected Sub btnForecast_Click(sender As Object, e As EventArgs)  
  
    Dim productId As Integer = Convert.ToInt32(txtProductId.Text)  
  
    Dim apiUrl As String = "http://maha.somee.com/publish/api/forecast/" & productId  
  
    Dim client As New WebClient()  
  
    Dim json As String = client.DownloadString(apiUrl)  
  
    Dim dt As DataTable =  
        JsonConvert.DeserializeObject(Of DataTable)(json)  
  
    gvForecast.DataSource = dt  
    gvForecast.DataBind()  
  
End Sub
```

```
End Class
```

Search

Aspx:

```
<%@ Page Language="VB" AutoEventWireup="false" CodeFile="search.aspx.vb" Inherits="search" %>
```

```
<!DOCTYPE html>
<html xmlns="http://www.w3.org/1999/xhtml">
<head runat="server">
  <title>Search Products - Pine Valley Furniture</title>
  <link rel="stylesheet" href="style.css" />
</head>
<body>

<form id="form1" runat="server">

<header>
  <h1>Search Products</h1>
</header>

<nav>
  <ul>
    <li><a href="index.aspx">Home</a></li>
    <li><a href="Cart.aspx">Cart</a></li>
  </ul>
</nav>

<div class="container">

  <div style="margin-bottom:20px;">

    <asp:Label Text="Search Product:" runat="server" />

    <asp:TextBox
      ID="txtSearch"
      runat="server"
      style="padding:8px; border-radius:6px; border:1px solid #ccc;">
    </asp:TextBox>

    <asp:Button
      ID="btnSearch"
      runat="server"
      Text="Search"
      CssClass="btn"
      OnClick="btnSearch_Click" />

    <asp:Button
      ID="btnShowAll"
      runat="server"
      Text="Show All"
      CssClass="btn"
      OnClick="btnShowAll_Click" />

  </div>
```

```
<asp:Label ID="lblMessage" runat="server"></asp:Label>

<br /><br />

<div class="product-grid">

  <asp:Repeater ID="rptProducts" runat="server" OnItemCommand="rptProducts_ItemCommand">

    <ItemTemplate>

      <div class="product-card">

        <div class="image-box"></div>

        <h3><%# Eval("Product_Description") %></h3>

        <p>Finish: <%# Eval("Product_Finish") %></p>

        <p><strong>$ <%# Eval("Standard_Price") %></strong></p>

        <div style="margin-top:10px;">
          Quantity:

          <asp:TextBox
            ID="txtQty"
            runat="server"
            Width="50px"
            style="padding:5px; border-radius:6px; border:1px solid #ccc;">
          </asp:TextBox>
        </div>

        <asp:Button
          ID="btnAdd"
          runat="server"
          Text="Add To Cart"
          CssClass="btn"
          style="margin-top:10px; width:100%;"
          CommandName="AddToCart"
          CommandArgument=<%# Eval("Product_Id") %>' />

        <br /><br />

        <asp:Button
          ID="btnRecommend"
          runat="server"
          Text="Show Recommendations"
          CssClass="btn"
          style="width:100%;"
          CommandName="Recommend"
          CommandArgument=<%# Eval("Product_Id") %>' />

      <br /><br />

    </ItemTemplate>

  </asp:Repeater>

</div>
```

```

        <asp:BulletedList
            ID="blRecommendations"
            runat="server">
        </asp:BulletedList>

    </div>

</ItemTemplate>

</asp:Repeater>

</div>

</div>

</form>
</body>
</html>

```

.vb:

```

Imports Newtonsoft.Json
Imports System.Collections.Generic
Imports System.Configuration
Imports System.Data.SqlClient
Imports System.Net

```

Partial Class search

Inherits System.Web.UI.Page

```

Dim connStr As String =
    ConfigurationManager.ConnectionStrings("PVFCConnectionString").ConnectionString

```

```

Protected Sub btnSearch_Click(sender As Object, e As EventArgs)

```

```

    Dim con As New SqlConnection(connStr)

```

```

    Dim query As String =
        "SELECT Product_Id, Product_Description, Product_Finish, Standard_Price " &
        "FROM PRODUCT_t WHERE Product_Description LIKE @search"

```

```

    Dim cmd As New SqlCommand(query, con)

```

```

    cmd.Parameters.AddWithValue("@search", "%" & txtSearch.Text & "%")

```

```

    con.Open()

```

```

    Dim dr As SqlDataReader = cmd.ExecuteReader()

```

```

    rptProducts.DataSource = dr
    rptProducts.DataBind()

```

```
con.Close()
```

```
End Sub
```

```
Protected Sub btnShowAll_Click(sender As Object, e As EventArgs)
```

```
Dim con As New SqlConnection(connStr)
```

```
Dim query As String =
```

```
"SELECT Product_Id, Product_Description, Product_Finish, Standard_Price FROM PRODUCT_t"
```

```
Dim cmd As New SqlCommand(query, con)
```

```
con.Open()
```

```
Dim dr As SqlDataReader = cmd.ExecuteReader()
```

```
rptProducts.DataSource = dr
```

```
rptProducts.DataBind()
```

```
con.Close()
```

```
End Sub
```

```
Protected Sub rptProducts_ItemCommand(source As Object, e As RepeaterCommandEventArgs)
```

```
' =====  
' ADD TO CART  
' =====
```

```
If e.CommandName = "AddToCart" Then
```

```
    If Session("Customer_Id") Is Nothing Then
```

```
        Response.Redirect("CustomerLogin.aspx")
```

```
        Exit Sub
```

```
    End If
```

```
Dim customerId As Integer =
```

```
    Convert.ToInt32(Session("Customer_Id"))
```

```
Dim productId As Integer =
```

```
    Convert.ToInt32(e.CommandArgument)
```

```
Dim txtQty As TextBox =
```

```
    CType(e.Item.FindControl("txtQty"), TextBox)
```

```
If txtQty.Text = "" Then
```

```
    lblMessage.Text = "Enter quantity."
```

```
    Exit Sub
```

```
End If
```

```

Dim quantity As Integer =
    Convert.ToInt32(txtQty.Text)

Dim con As New SqlConnection(connStr)

con.Open()

Dim orderId As Integer = 0

Dim checkOrderQuery As String =
    "SELECT TOP 1 Order_Id FROM ORDER_t WHERE Customer_Id = @cid AND Order_Date =
    CAST(GETDATE() AS DATE)"

Dim cmdCheckOrder As New SqlCommand(checkOrderQuery, con)

cmdCheckOrder.Parameters.AddWithValue("@cid", customerId)

Dim result = cmdCheckOrder.ExecuteScalar()

If result Is Nothing Then

    Dim newIdQuery As String =
        "SELECT ISNULL(MAX(Order_Id),1000)+1 FROM ORDER_t"

    Dim cmdNewId As New SqlCommand(newIdQuery, con)

    orderId = Convert.ToInt32(cmdNewId.ExecuteScalar())

    Dim insertOrderQuery As String =
        "INSERT INTO ORDER_t VALUES (@oid, @cid, CAST(GETDATE() AS DATE))"

    Dim cmdInsertOrder As New SqlCommand(insertOrderQuery, con)

    cmdInsertOrder.Parameters.AddWithValue("@oid", orderId)
    cmdInsertOrder.Parameters.AddWithValue("@cid", customerId)

    cmdInsertOrder.ExecuteNonQuery()

Else

    orderId = Convert.ToInt32(result)

End If

Dim checkLineQuery As String =
    "SELECT Ordered_Quantity FROM Order_line_t WHERE Order_Id = @oid AND Product_Id = @pid"

Dim cmdCheckLine As New SqlCommand(checkLineQuery, con)

cmdCheckLine.Parameters.AddWithValue("@oid", orderId)
cmdCheckLine.Parameters.AddWithValue("@pid", productId)

Dim existingQty = cmdCheckLine.ExecuteScalar()

```

If existingQty IsNot Nothing Then

```
Dim newQty As Integer =  
    Convert.ToInt32(existingQty) + quantity
```

```
Dim updateQuery As String =  
    "UPDATE Order_line_t SET Ordered_Quantity = @qty WHERE Order_Id = @oid AND Product_Id =  
@pid"
```

```
Dim cmdUpdate As New SqlCommand(updateQuery, con)
```

```
cmdUpdate.Parameters.AddWithValue("@qty", newQty)  
cmdUpdate.Parameters.AddWithValue("@oid", orderId)  
cmdUpdate.Parameters.AddWithValue("@pid", productId)
```

```
cmdUpdate.ExecuteNonQuery()
```

Else

```
Dim insertLineQuery As String =  
    "INSERT INTO Order_line_t VALUES (@oid, @pid, @qty)"
```

```
Dim cmdInsertLine As New SqlCommand(insertLineQuery, con)
```

```
cmdInsertLine.Parameters.AddWithValue("@oid", orderId)  
cmdInsertLine.Parameters.AddWithValue("@pid", productId)  
cmdInsertLine.Parameters.AddWithValue("@qty", quantity)
```

```
cmdInsertLine.ExecuteNonQuery()
```

End If

```
con.Close()
```

```
lblMessage.Text = "Product added to YOUR cart!"
```

End If

If e.CommandName = "Recommend" Then

```
Dim productId As Integer =  
    Convert.ToInt32(e.CommandArgument)
```

```
Dim apiUrl As String =  
    "http://maha.somee.com/publish/api/recommendations/" & productId
```

```
Dim client As New WebClient()
```

```
Dim json As String =  
    client.DownloadString(apiUrl)
```

```

Dim recommendations As List(Of String) =
    JsonConvert.DeserializeObject(Of List(Of String))(json)

Dim bl As BulletedList =
    CType(e.Item.FindControl("blRecommendations"), BulletedList)

bl.DataSource = recommendations
bl.DataBind()

End If

End Sub

End Class

```

Cart .aspx

```

<%@ Page Language="VB" AutoEventWireup="true" CodeFile="Cart.aspx.vb" Inherits="Cart" %>

<!DOCTYPE html>
<html>
<head runat="server">
    <title>My Cart</title>
    <link rel="stylesheet" href="style.css" />
</head>
<body>

<form id="form1" runat="server">

    <h2>My Cart</h2>

    <asp:GridView ID="gyCart" runat="server" AutoGenerateColumns="False" CssClass="cart-table">

        <Columns>
            <asp:BoundField DataField="Product_Description" HeaderText="Product" />
            <asp:BoundField DataField="Quantity" HeaderText="Quantity" />
            <asp:BoundField DataField="Price" HeaderText="Price" DataFormatString="{0:C}" />
            <asp:BoundField DataField="Total" HeaderText="Total" DataFormatString="{0:C}" />
        </Columns>

    </asp:GridView>

    <br />

    <asp:Label ID="lblGrandTotal" runat="server" Font-Bold="True"></asp:Label>

    <br /><br />

```

```

<asp:Button
  ID="btnCheckout"
  runat="server"
  Text="Proceed to Checkout"
  PostBackUrl="Payment.aspx"
  CssClass="btn" />

<hr />

<h3>Reordering Suggestions</h3>

<asp:Button
  ID="btnReorder"
  runat="server"
  Text="Show Reorder Suggestions"
  CssClass="btn"
  OnClick="btnReorder_Click" />

<br /><br />

<asp:BulletedList
  ID="blReorder"
  runat="server">
</asp:BulletedList>

</form>

</body>
</html>

```

.vb:

```

Imports Newtonsoft.Json
Imports System.Collections.Generic
Imports System.Configuration
Imports System.Data
Imports System.Data.SqlClient
Imports System.Net

```

Partial Class `Cart`

Inherits `System.Web.UI.Page`

Private `connStr As String =`

`ConfigurationManager.ConnectionStrings("PVFConnectionString").ConnectionString`

Protected Sub `Page_Load(sender As Object, e As EventArgs) Handles Me.Load`

`If Not IsPostBack Then`

`LoadCart()`

`End If`

End Sub

Private Sub LoadCart()

```
If Session("Customer_Id") Is Nothing Then
    Response.Redirect("CustomerLogin.aspx")
Return
End If
```

```
Dim customerId As Integer =
    Convert.ToInt32(Session("Customer_Id"))
```

```
Using conn As New SqlConnection(connStr)
```

```
Dim query As String =
    "SELECT p.Product_Description, " &
    "ol.Ordered_Quantity AS Quantity, " &
    "p.Standard_Price AS Price, " &
    "(ol.Ordered_Quantity * p.Standard_Price) AS Total " &
    "FROM ORDER_t o " &
    "INNER JOIN Order_line_t ol ON o.Order_Id = ol.Order_Id " &
    "INNER JOIN PRODUCT_t p ON ol.Product_Id = p.Product_Id " &
    "WHERE o.Customer_Id = @CustomerId " &
    "AND o.Order_Id = (SELECT MAX(Order_Id) FROM ORDER_t WHERE Customer_Id = @CustomerId)"
```

```
Using cmd As New SqlCommand(query, conn)
```

```
cmd.Parameters.AddWithValue("@CustomerId", customerId)
```

```
Dim dt As New DataTable()
```

```
Using da As New SqlDataAdapter(cmd)
    da.Fill(dt)
End Using
```

```
gvCart.DataSource = dt
gvCart.DataBind()
```

```
Dim grandTotal As Decimal = 0
```

```
For Each row As DataRow In dt.Rows
    grandTotal += Convert.ToDecimal(row("Total"))
Next
```

```
lblGrandTotal.Text = "Grand Total: " & grandTotal.ToString("C")
```

```
End Using
```

```
End Using
```

End Sub

Protected Sub btnReorder_Click(sender As Object, e As EventArgs)

```
If Session("Customer_Id") Is Nothing Then
    Response.Redirect("CustomerLogin.aspx")
    Exit Sub
End If

Dim customerId As Integer =
    Convert.ToInt32(Session("Customer_Id"))

Dim apiUrl As String =
    "http://maha.somee.com/publish/api/reorder/" & customerId

Dim client As New WebClient()

Dim json As String =
    client.DownloadString(apiUrl)

Dim items As List(Of String) =
    JsonConvert.DeserializeObject(Of List(Of String))(json)

blReorder.DataSource = items
blReorder.DataBind()

End Sub

End Class
```